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IS : 9001 (Part 17/Sec 5) - 1988
(Reaffirmed 2004)

Indian Standard

GUIDANCE FOR ENVIRONMENTAL TESTING

PART 17 IMPACT TEST

Section 5 Bounce

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

Gr 2 *October* 1988

Indian Standard

GUIDANCE FOR ENVIRONMENTAL TESTING

PART 17 IMPACT TEST

Section 5 Bounce

0. FOREWORD

0.1 This Indian Standard (Part 17/Sec 5) was adopted by the Bureau of Indian Standards on 22 June 1988, after the draft finalized by the Environmental Testing Procedures Sectional Committee had been approved by the Electronics and Telecommunication Division Council.

0.2 This section of the standard (Part 17/Sec 5) deals with guidance details for bounce test. Sections 1 to 4 of this standard cover guidance details for the following tests:

a) Shock test,
b) Bump test,
c) Drop and topple test, and
d) Free fall test.

0.2.1 The test procedure for bounce test is covered in IS : 9000 (Part 7/Sec 6) - 1988*.

0.3 This standard is largely based on IEC Pub 68-2-55 'Test E and guidance bounce', issued by the International Electrotechnical Commission (IEC).

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960†. The number of significant places retained in the rounded off value should by the same as that of the specified value in this standard.

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*Basic environmental testing procedures for electronic and electrical items : Part 7 Impact test, Section 6 Test Ee: Bounce.

†Rules for rounding off numerical values (*revised*)

1. SCOPE

1.1 This standard (Part 17/Sec 5) covers guidance details for bounce test.

2. RELATED TESTS

2.1 The related tests are given below:

Test Ea: Shock [Section 1 of IS : 9001 (Part 7) - 1979]*	— is intended to reproduce the effects of non-repetitive shocks likely to be encountered by equipment and components in service and during transportation.
Test Eb: Bump [Section 2 of IS : 9000 (Part 7) - 1979]*	— is intended to reproduce the effects of repetitive shocks likely to be experienced by equipment and components during transportation or when installed in various classes of vehicles.
Test Ed: Free fall [Section 4 of IS : 9000 (Part 7) - 1979)*	— is a simple test intended to assess the effects of falls likely to be experienced due to rough handling.
Test Ed: Free fall repeated [Section 5 of IS : 9000 (Part 7) - 1979]*	— is intended to reproduce the effects of repetitive shocks likely to be received by certain component type items, for example, connectors in service.

3. GENERAL

3.1 Items when carried as loose cargo by overland transport may be subjected to severe and repetitive shock from impacting, rebounding and scuffing on the floor of the transporting vehicle or from colliding with the side walls of the vehicle or other cargo. Even when tied to the vehicle platform, they may be subjected to similar shock if the constraint allows freedom of movement.

3.2 The severity of the shock depends upon the location in the vehicle, the type of surface being traversed (for example, a pot-holed road, an off-the-road terrain), the accumulated duration of transportation and, in particular, the dynamic characteristics of the specimen. An item, having a high degree of resilience, will rebound on impact with the vehicle platform and is more likely to collide with side walls and other cargo.

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*Basic environmental testing procedures for electronic and electrical items : Part 7 Impact test.

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A non-resilient item would tend more to remain in close contact with the platform and would not normally be subjected to such severe impact.

3.3 The bounce test fulfils a similar function to the bump test, but since the item is not fastened to the test platform, it more closely simulates the stress resulting from impact and shock to which an item would be subjected when carried loose in a vehicle. It is primarily applicable to equipment type items and packages (*see* **9.2**).

4. BARRIER ARRANGEMENT [*see* 5.2, 5.6.1 and 5.6.2 of IS : 9000 (Part 7/Sec 6)-1988*]

4.1 Barriers need to be constructed on the platform of the bounce tester so that the impact of the item with the sides of a vehicle can be simulated. These barriers should be constructed with the specified clearance and be of timber walls, timber faced steel channels or square sectioned timber. A typical barrier arrangement is shown in Fig. 1.

5. METHOD OF TEST [*see* 5.6 of IS : 9000 (Part 7/Sec 6)-1988*]

5.1 Two methods of carrying out the bounce test are given in IS : 9000 (Part 7/Sec 6) - 1988* and the relevant specification should state which is to be applied. Method A gives a circular motion of amplitude and speed sufficient to produce an acceleration in excess of $1g_n$ in the vertical plane. The vertical motion induces bounce and the horizontal motion induces occasional impact with the barrier rails. Method B is based on a non-synchronous motion of the platform in which two drive points are driven at different speeds. This results in a motion which progressively changes from linear vertical to pitching; the vertical motion induces bounces, the pitching motion impact with the barrier rails. A mechanism which will produce this motion for both methods is shown in Fig. 2. In the present state of the art, based on user experience, both methods are considered to be equally effective in simulating the transportation invironment. However, to produce the same effects on the item during conditioning, the severity will need to be selected taking into account the method to be used (*see* **6**). Also, because of the different motions of the platform, it is necessary to specify different clearances between the test item and the barriers for the two methods.

NOTE — g_n stands for standard acceleration due to the earth's gravity which itself varies with altitude and geographical latitude. For the purpose of this standard, the value of g_n is rounded up to nearest unit, that is, 10 m/s².

5.2 The motion experienced by the item when testing by Method B is almost comparable in severity to the environment during transportation in a lightly laden four-wheeled road vehicle traversing pot-holed pave at a speed between 10 and 15 km/h with the item located over the rear axle.

6. TEST SEVERITIES [*see* 6 of IS : 9000 (Part 7/Sec 6) - 1988*]

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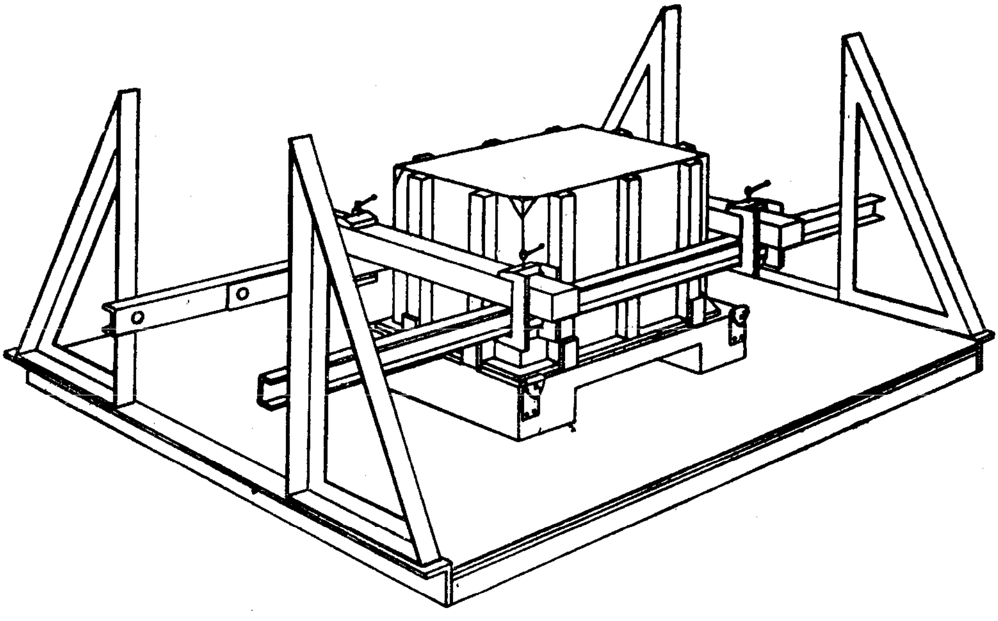
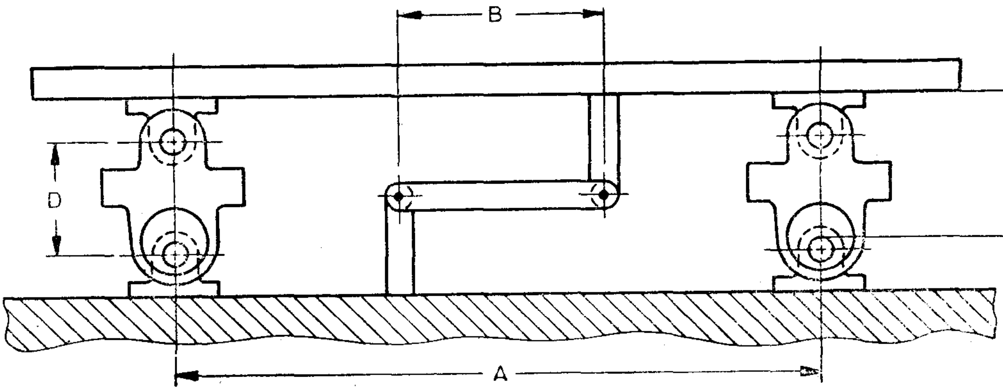


FIG. 1 TYPICAL ARRANGEMENT OF BARRIERS



Dimensions

$600 \text{ mm} \leqslant A \leqslant 1\,700 \text{ mm}$
$B \geqslant 250 \text{ mm}$
$C = 0{\cdot}25\, A \pm 5$ percent
$D = 0{\cdot}08\, A \pm 5$ percent

FIG. 2 BASIC DRIVE MECHANISM

6.1 The severity of the bounce test is defined by the duration: four levels of severity are specified. The longer durations of 60 and 180 min would apply for items which are subject to severe shock from off-the-road transportation of journeys over heavily pot-holed roads or tracks, and where the exposure to those conditions is of, or can accumulate over, a long period.

6.2 The shorter durations of 5 and 15 min would represent the survival of a brief journey as loose cargo in a vehicle, over surfaces ranging from normal highway to pot-holed roads, pave or rough tracks.

6.3 Researchers have shown that the environments experienced by item during transportation in road vehicles traversing unpaved roads are similar to those during a bounce test. The bounce test, however, makes a time-compression and each 2 min duration for Method A or each 1 min duration for Method B approximately corresponds to 5 min transportation by a road vehicle over an unpaved and pot-holed road. Figure 3 shows a typical peak acceleration count measured on a test item when subjected to transportation by road vehicle over a pot-holed road and the results obtained using the two test methods that are given in IS : 9000 (Part 7/Sec 6) - 1988.*

7. ITEM AXES AND DIRECTIONS OF BOUNCE [*see* 9 of IS : 9000 (Part 7/Sec 6) - 1988*]

7.1 The axes and direction of bounce chosen for the test should be representative of its attitudes during transportation. Items which will always be transported on a dedicated base need only be subjected to the bounce test when resting on that base. For item which may be carried resting on more than one of its faces, the test should be

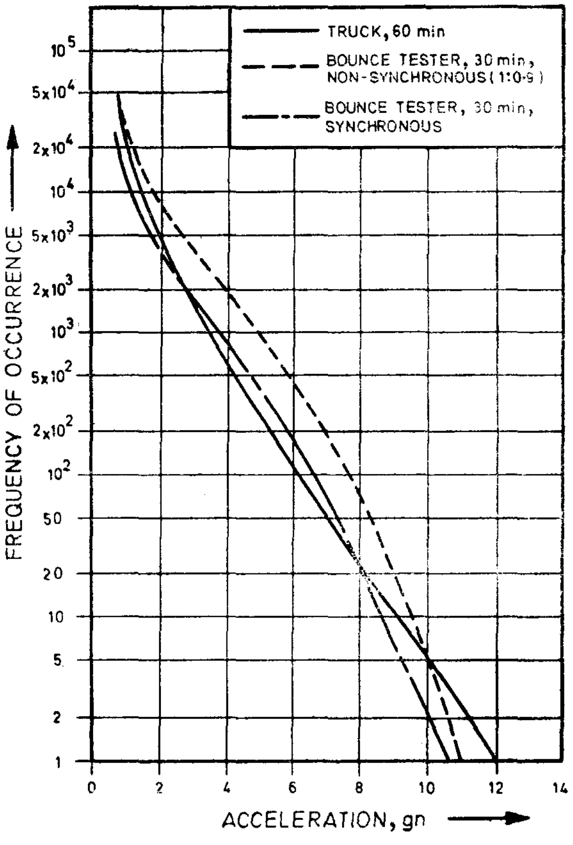


FIG. 3 ACCELERATION DISTRIBUTION FOR ITEM DURING TRUCK TRANSPORTATION AND DURING BOUNCE TESTING

carried out on each face prescribed by the relevant specification. To simulate the impact with the walls of the vehicle platform or with other cargo, the item resting on each relevant face needs to be turned through 90° on the horizontal plane so that the impact with the barriers of the test machine is applied to each vertical face.

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*Basic environmental testing procedures for electronic and electrical items: Part 7 Impact test, Section 6 Test Ee: Bounce.

8. STACKED ITEMS [*see* of IS : 9000 (Part 7/Sec 6) - 1988*]

8.1 When items are stacked in a vehicle, there can be a significant difference between the environments experienced by the top and bottom layers. It is the transport case of a specimen which is most vulnerable when it is in the bottom layer whilst in the top layer it is the contents. In these circumstances, it may be necessary to vary the positions of the specimens in the stack.

9. FUNCTIONAL CHECKS [*see* 8 and 10 of IS : 9000 (Part 7/Sec 6) - 1988*]

9.1 Components and Equipment — Damage to items, although it may be detected as change in performance, is usually of a mechanical nature such as loosening of screws and failure of mechanical parts and/or connections. At the completion of the test, particular attention should be given to this type of damage and its probable effect on performance.

9.2 Items Including Transport Cases — In evaluating the performance of items which include the transport case, note should be made of any loosening of screws or fastenings damage to the case and fittings, the strength and location of load spreading parts and the bedding down of any cushioning or space-filling material. The test can also cause deterioration of any climatic protection, for example, through scuffing and damage to proctective coatings.

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